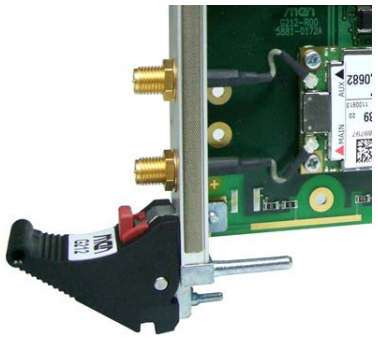
User Manual

G212 – 3U CompactPCI® Serial PCIe® Mini Card Carrier

Configuration example



G212 - 3U CompactPCI® Serial PCIe® Mini Card Carrier for Wireless Functions

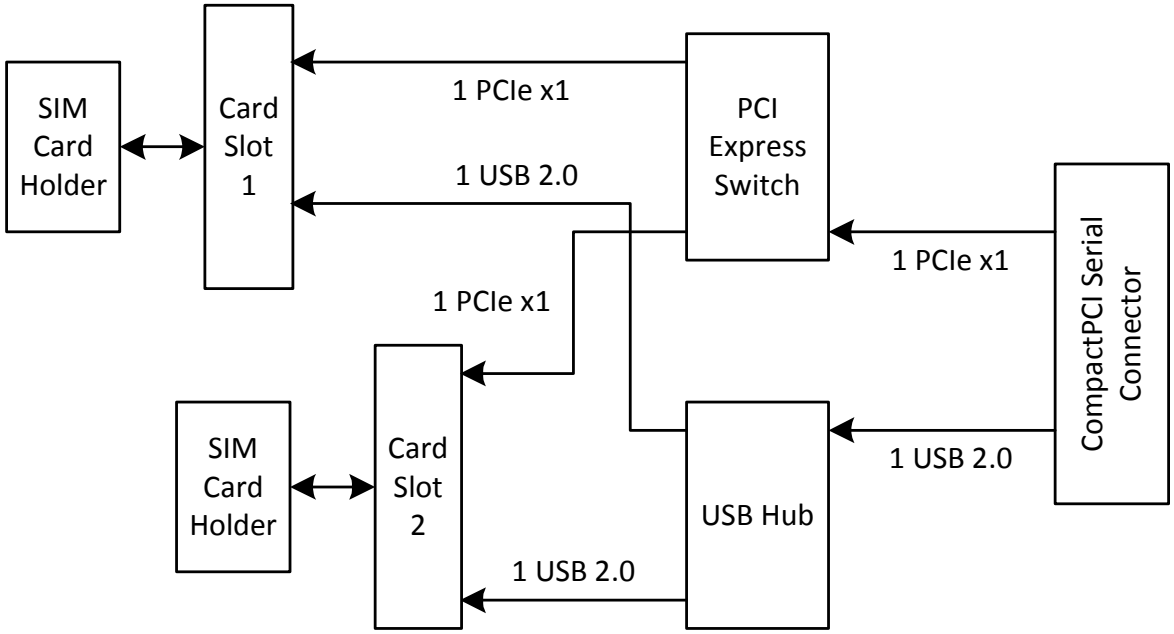
The G212 is a rugged single Eurocard CompactPCI® Serial carrier board supporting the PCI Express® Mini Card standard or, as an option, the ExpressCard® standard. ExpressCard® is the successor of the CardBus standard and offers different construction sizes as well as connection via PCI Express® or USB 2.0.

The standard version of the G212 offers two PCI Express® Mini Card slots. It allows to use all types of cards for HF applications, for example GPS, WLAN, UMTS, GSM, or HSDPA. Each card is connected to two robust redundant external SMA antenna connectors at the front panel of the G212.

Using these standard cards that give access to the whole world of common notebook PC expansions is a fast and easy way to extend the functionality of a CompactPCI® Serial system as well.

The G212 is designed for -40 to +85°C operating temperature and prepared for conformal coating in order to be used also in harsh and mobile environments. The final environmental qualification depends on the respective cards used on the carrier.

Diagram


SIM Card Holder
Card Slot 1
1 PCIe x1
1 USB 2.0
PCI Express Switch
1 PCIe x1
CompactPCI Serial Connector
1 PCIe x1
SIM Card Holder
Card Slot 2
USB Hub
1 USB 2.0
1 USB 2.0

Technical Data

Card Interfaces

- Two PCI Express® Mini Cards (only full size) or
- Two ExpressCard®/34 modules
- One ExpressCard®/54 module
- SIM card holder
- USB and PCI Express® interface
- Please note that MEN does not offer SIM cards or mobile telephony contracts!

Front Connections

- Four Reverse SMA antenna connectors

CompactPCI® Serial

- Compliance with CompactPCI® Serial PICMG CPCI-S.0 Specification
- Peripheral slot
- Host interface: one PCI Express® x1 link and a differential pair of USB lines
  - PCIe® 1.1: Data rate up to 250 MB/s in each direction (2.5 Gbit/s per lane)
  - USB 2.0: Data rate up to 480 Mbit/s

Electrical Specifications

- Supply voltage/power consumption:
  - +12V (-10%/+10%), depending on plugged card, 0.1A max. w/o card

Mechanical Specifications

- Dimensions: conforming to CompactPCI® Serial specification for 3U boards
- Front panel: 4HP or 8HP with ejector
- Weight: 134g (without cards)

Environmental Specifications

- Temperature range (operation):
  - -40..+85°C (screened, only carrier, depending on configuration)
  - Airflow: min. 1.0 m/s
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 1g/10..150Hz
- Conformal coating on request

MTBF

- MTBF: 2,534,034h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Conforming to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)

Software Support

- PCIe® Mini Card and ExpressCard® drivers as supported

Configuration Options

Card Slots

- Two PCI Express® Mini Cards
- Two ExpressCard®/34 modules
- One ExpressCard®/54 module

I/O

- 4 USB interfaces at the front

Cooling Concept

- Also available with conduction cooling in MEN CCA frame

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

For available standard configurations see online data sheet.

Product Safety

Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the board only in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

History

Issue	Comments	Date
E1	First issue	2010-05-10
E2	Added SMBus Functionality chapter. Fixed pin assignment tables for PCI Express Mini Card	2014-01-16

Conventions

This sign marks important notes or warnings concerning the use of voltages which can lead to serious damage to your health and also cause damage or destruction of the component.

This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

italics — Folder, file and function names are printed in *italics*.

bold — **Bold** type is used for emphasis.

`monospace` — A `monospaced` font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

comment — Comments embedded into coding examples are shown in green color.

hyperlink — Hyperlinks are printed in blue color.

The globe will show you where hyperlinks lead directly to the Internet, so you can look for the latest information online.

IRQ#
/IRQ — Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out — Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

Vertical lines on the outer margin signal technical changes to the previous issue of the document.

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The WEEE directive does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company which puts the product on the market, as defined in the directive; components and sub-assemblies are not subject to product compliance.

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1 Getting Started

This chapter gives an overview of the board and some hints for first installation in a system.

1.1 Map of the Board

Figure 1. *Map of the board – front panel*

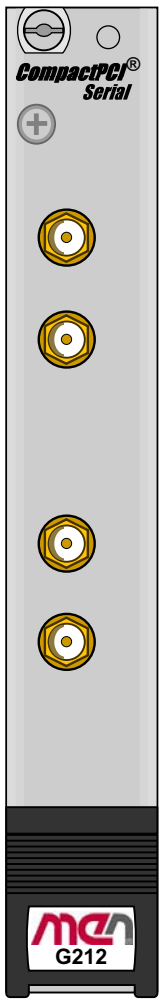
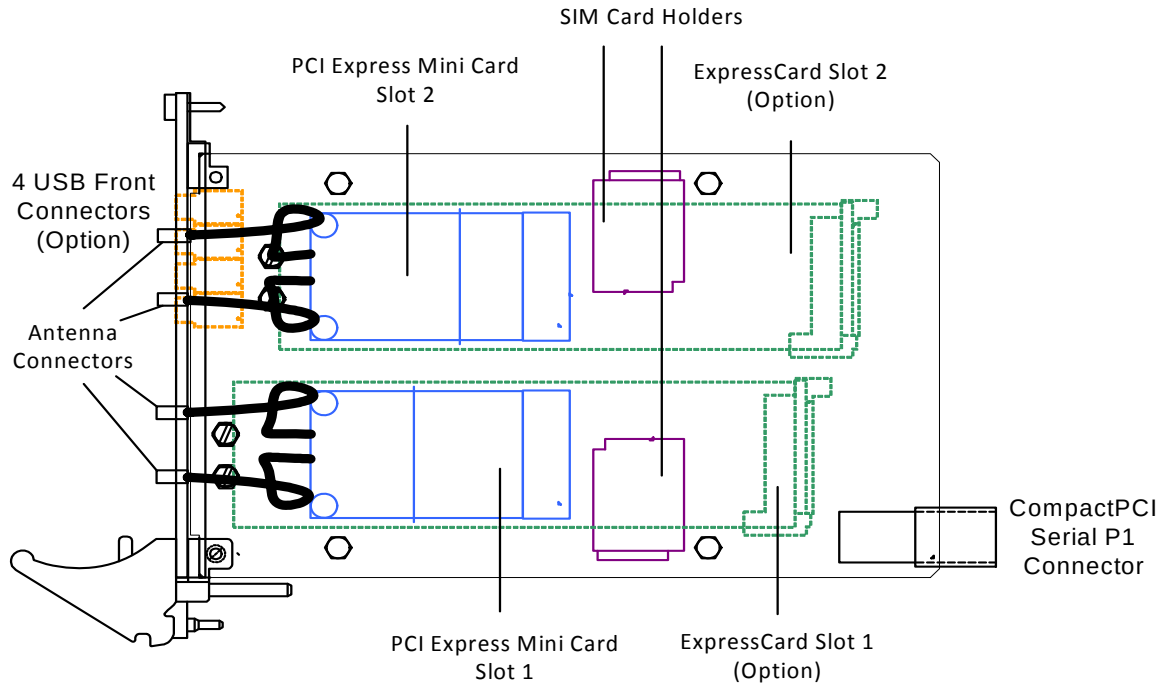


Figure 2. *Map of the board – top view*



1.2 Integrating the Board into a System

You can use the following "check list" when installing the G212 in a CompactPCI Serial system for the first time.

☑ Power-down the system.

☑ Install one or two PCI Express Mini Cards (or optionally ExpressCards) on the G212 as described in Chapter 2.2.1 Installing a PCI Express Mini Card on page 21.

☑ Insert the G212 into a peripheral slot of your CompactPCI Serial system, making sure that the CompactPCI Serial connectors are properly aligned.

Note: The peripheral slots of every CompactPCI Serial system are marked by a circle ○ on the backplane and/or at the front panel.

☑ Power-up the system.

☑ You can now install driver software.

1.3 Installing Driver Software

For a detailed description on how to install driver software please refer to the respective documentation.

2 Functional Description

2.1 Power Supply

The G212 is supplied with a primary +12V voltage via the CompactPCI Serial connector P1.

2.2 PCI Express Mini Card Interface

PCI Express Mini cards are small form factor PCI Express Cards.

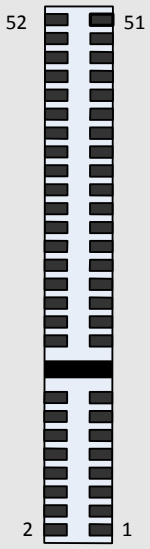
The main differences between an ExpressCard and a PCI Express Mini Card is a smaller form factor optimized for mobile computing platforms and a card-system interconnection optimized for communication applications. PCI Express Mini Card cards also use smaller connectors than standard ExpressCards.

The G212 supports the PCI Express Mini Card Standard but only full-size cards can be used.

A single PCI Express lane (x1) and a USB connection are supported on the board.

The board is equipped with two 52-pin standard PCI Express Mini Card connectors. The following standard signals are supported (signal directions according to PCI Express Mini Card Standard):

Table 1. *Pin assignment of 52-pin PCI Express Mini Card connector*



52	+3.3Vaux	51	reserved
50	GND	49	reserved
48	+1.5V	47	reserved
46	LED_WPAN#	45	reserved
44	LED_WLAN#	43	GND
42	LED_WWAN#	41	+3.3Vaux
40	GND	39	+3.3Vaux
38	USB_D+	37	GND
36	USB_D-	35	GND
34	GND	33	PETp0
32	SMB_DATA	31	PETn0
30	SMB_CLK	29	GND
28	+1.5V	27	GND
26	GND	25	PERp0
24	+3.3Vaux	23	PERn0
22	PERST#	21	GND
20	W_DISABLE#	19	reserved
18	GND	17	reserved
16	UIM_VPP	15	GND
14	UIM_RESET	13	REFCLK+
12	UIM_CLK	11	REFCLK-
10	UIM_DATA	9	GND
8	UIM_PWR	7	CLKREQ#
6	1.5V	5	COEX2
4	GND	3	COEX1
2	+3.3Vaux	1	WAKE#

Table 2. *Signal mnemonics of 52-pin PCI Express Mini Card connector*

	Signal	Direction	Function
Power	GND		Ground
	+3.3Vaux		3.3V source
	1.5V		1.5V source
SIM card	UIM_PWR	out	SIM card power
	UIM_DATA	in/out	SIM card data
	UIM_CLK	out	SIM card clock
	UIM_RST	out	SIM card reset
	UIM_VPP		not connected
PCI Express	REFCLK-/REF-CLK+	in	PCI Express differential reference clock
	PERn0/PERp0	out	PCI Express receive signals
	PETn0/PETp0	in	PCI Express transmit signals
Auxiliary Signals	CLKREQ#	out	Clock request
	PERST#	in	Reset for the Mini Card
	WAKE#	out	Wake signal
	SMB_CLK	in	System management bus clock (not connected)
	SMB_DATA	in/out	System management bus data (not connected)
USB	USB_D-	in/out	USB line
	USB_D+	in/out	USB line
Communi-cations - specific signals	LED_WWAN#	out	not connected
	LED_WLAN#	out	not connected
	LED_WPAN#	out	not connected

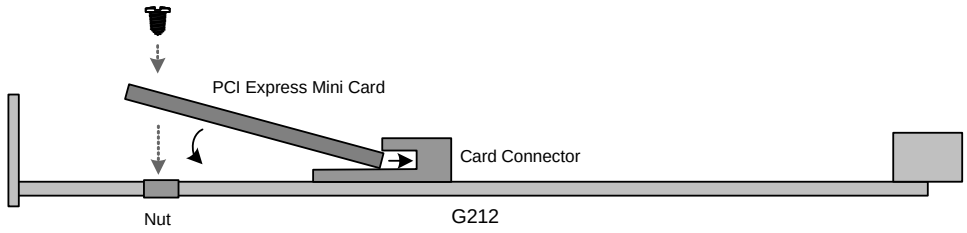
Please refer to the PCI Express Mini Card Specification for further details. See Chapter 3.1 Literature and Web Resources on page 27.

2.2.1 Installing a PCI Express Mini Card

Perform the following steps to install a PCI Express Mini card. The required screws are included in the delivery.

- ☑ Insert the PCI Express Mini card into the card connector in a 30° angle.
- ☑ Rotate the card down until it sits firmly in the connector.
- ☑ Screw the PCI Express Mini Card tightly to the G212. See Figure 3, Installing PCI Express Mini Card.
- ☑ Connect the antennae to the PCI Express Mini Card.

Figure 3. *Installing PCI Express Mini Card*



2.3 ExpressCard Interface (Optional)

According to the ExpressCard standard there are two standard formats of ExpressCard modules: the ExpressCard/34 module which is 34 mm wide and the ExpressCard/54 module characterized by its 54 mm width. ExpressCard/34 modules and ExpressCard/54 modules both use the same connector interface.

The board supports both type 34 and 54.

A single PCI Express lane (x1) and a USB connection are supported on the board.

The ExpressCards on the G212 cannot be hot-plugged as they are mounted behind the front panel.

The board is equipped with up to two 26-pin standard ExpressCard connectors. The following standard signals are supported:

Table 3. *Signal mnemonics of 26-pin ExpressCard connector*

Pin	Signal	Direction	Function
1	GND		Power
2 3	USBD- USBD+	in/out	Differential pair of USB lines
4	CPUSB#	out	USB power detection
5	Reserved		
6	Reserved		
7	SMBCLK	out	System management bus clock (not connected)
8	SMBDATA	in/out	System management bus data (not connected)
9 10	+1.5V	in	Power
11	WAKE#	out	Wake signal from MiniCard slot
12	+3.3V AUX	in	Power
13	PERST#	in	Express card reset
14 15	+3.3V	in	Power
16	CLKREQ#	out	Clock request from MiniCard slot
17	CPPE#	out	PCIe power detection
18 19	REFCLK- REFCLK+	in	PCI Express differential reference clock
20	GND		Power
21 22	PERn0, PERp0	out	PCI Express receive signals
23	GND		Power

Pin	Signal	Direction	Function
24	PETn0	in	PCI Express transmit signals
25	PETp0		
26	GND		Power

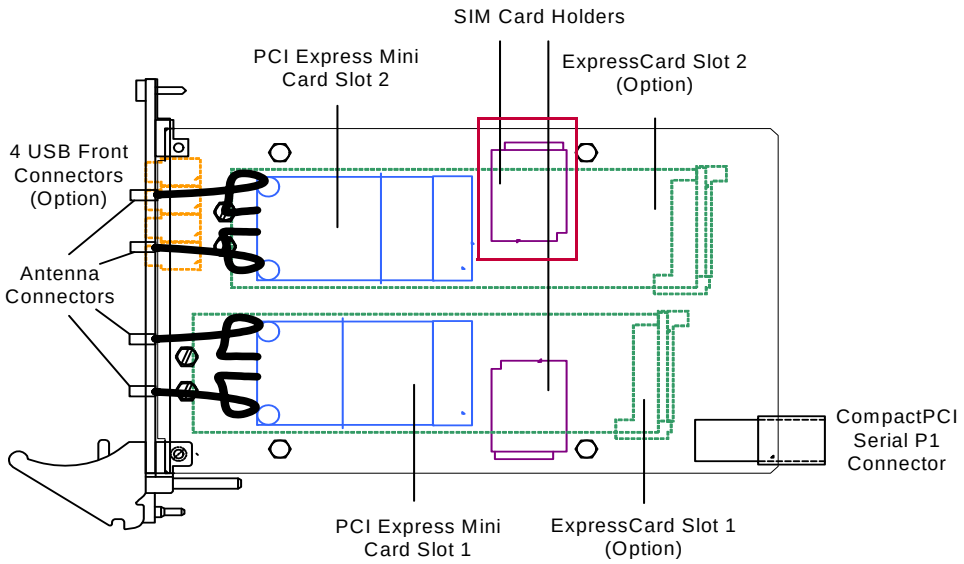
Please refer to the ExpressCard Specification for further details. See Chapter 3.1 Literature and Web Resources on page 27.

2.4 SIM Card Holder

The G212 is equipped with a SIM card holder.

To get access to a mobile phone network you need a SIM card (subscriber identity module) and a contract with a mobile service provider. **Please note that MEN does not provide mobile services or SIM cards!**

Figure 4. *Position of SIM card holder*



2.5 SMBus Functionality

The board can be configured using SMBus. The board's SMBus address is set using a hex switch (see Chapter Figure 1. Map of the board – front panel on page 15).

If there are several ICs in your system which are controlled via SMBus, there might be address collisions as one address may not occur more than once. Via the hex switch you can select an address from a certain address range. It is set to a default value at the factory.

Table 4. *Position of hex switch for setting the SMBus address*

	Switch position	SMBus Address
	0	0x40
	1	0x42
	2	0x44
	3	0x46
	4	0x48
	5	0x4A
	6	0x4C
	7	0x4E
	8..F	not allowed

2.5.1 Reset

In order to be able to reset the board during operation, you can switch off the power supply of the PCI Express Mini Cards or ExpressCards using the SMBus. Thus, in case of an error, the board can be reset without having to shut down the whole system.

Perform the following steps to switch the power supply on or off:

- ☑ Perform a write byte command on the address of the I^2C expander set by the hex switch
- ☑ Write the value for your required configuration

2.6 CompactPCI Serial Interface

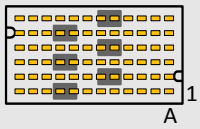
The G212 uses one PCI Express x1 link and one USB interface at the backplane according to the CompactPCI Serial specification (PICMG CPCI-S.0, proposed standard under development).

Connector type of P1:

- 72-pin Airmax VS 4 pair, right angle header, 6 IMLA with end walls

See Table 5, Pin assignment of CompactPCI Serial P1 connector for the pin assignment of the P1 connector.

Table 5. *Pin assignment of CompactPCI Serial P1 connector*



-	-	GND	-	-	GND	-	-	GND	-	-	GND	6
GND	-	-	GND	-	-	GND	PE_ Rx00-	PE_ Rx00+	GND	PE_ Tx00-	PE_ Tx00+	5
-	-	GND	-	-	GND	PE_ REFCLK-	PE_ REFCLK+	GND	1_ USB2-	1_ USB2+	GND	4
-	-	-	GA2	-	-	GA1	-	-	GA0	-	-	3
-	PCIE_ EN#	GND	PE_ WAKE#	RST_ IN#	GND	reserved	reserved	GND	IPM- B_SDA	IPMB_ SCL	GND	2
GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND	-	-	1
L	K	J	I	H	G	F	E	D	C	B	A	

3 Appendix

3.1 Literature and Web Resources

- G212 data sheet with up-to-date information and documentation:
  www.men.de/products/02G212-.html

3.1.1 PCI Express Mini Card

- PCI Express Mini Card Electromechanical Specification
  Revision 1.2; October 26, 2007
  PCI Special Interest Group
  www.pcisig.com

3.1.2 ExpressCard

- ExpressCard Electromechanical Specification, Revision 1.0a
  PCI Special Interest Group
  www.pcisig.com

3.2 Finding out the Product's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or design revisions of the G212. You can find information on the article number, the design revision and the serial number on two labels attached to the board.

- **Article number:** Gives the product's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 5. *Labels giving the product's article number, revision and serial number*